

Diffusion Modes of an Equimolar Methane-Ethane Mixture Along the Critical Isochore from Dynamic Light Scattering

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The hydrodynamic diffusion modes of an equimolar methane-ethane mixture have been investigated by dynamic light scattering. Measurements were performed over a wide temperature range between the plait critical point at 263.55 K and 310 K along the critical isochore. Two relaxation modes have been observed which are commonly associated with pure mass diffusion and pure thermal diffusion, respectively, but in near-critical binary fluid mixtures – according to recent theory – may alternatively be interpreted as two effective diffusivities resulting from a coupling between mass and thermal diffusion. Diffusivity values for the slow mode were obtained with typical standard deviations of one percent over the whole temperature range, whereas the small amplitude of the fast mode only allowed values of this component with a relatively large measurement uncertainty. The results are discussed in connection with literature data available for the thermophysical properties of this binary fluid mixture and regarding the various possibilities of theoretical interpretation.